Implications of changes in the gendered educational advantage on family building: An agent-based model of first partnership formation in Sweden (The age-educational attainment trade-off)

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Abstract

We have seen an expansion of the new pattern of female educational advantage in Western Europe in recent decades. As educational policies have increasingly offered equal opportunities for women and men to attain higher levels of schooling, in parallel with increasing labour force aspirations of young people independently of their sex, the share of highly educated women has greatly increased over the decades and exceeded that of men across Europe from the 1990s onwards. Thus there are now more highly-educated women than men entering the mating market. This suggests a new gender imbalance, a reversal of the previous pattern of male dominance in higher education into a female educational advantage. This is true also for Sweden. The new pattern can generate tensions with respect to the traditional pattern of partnership formation characterized by female educational hypergamy, and hence leading to an education-specific mating squeeze.

In this study, we address the effect of changes in the gendered educational advantage on family building. We use agent-based modelling (ABM) to explore whether the gender- and educational structure of a society under certain education- and age-specific preferences for mating can lead to imbalances in first partnership formation across groups, and if so the extent of that impact. Specifically, we seek to explore the demographic outcomes of different preference scenarios, examining some of the "escape routes" suggested by van Bavel (2012).

Our results indicate that shifts in age preference have a larger impact on partnership patterns than shifts in education preference. Moreover, comparing our simulations with the patterns detected in the Swedish GGS data, we find that different educational level groups may follow different routes. For low-educated cohabiting women, shift in age preference (escape route #3) is the scenario that closest resembles in a qualitative way the patterns observed in the GGS dataset. In contrast, for middle- and highly-educated cohabiting women, we see an increase in educational homogamy (escape route #1). For first marriage, the shift in age preference scenario (escape route #3) works well both for low- and middle-educated women, while highly-educated women seem to follow the path of strengthened educational homogamy (escape route #1).

Keywords: first partnership formation, cohabitation, marriage, reversal of gender imbalance in education, education- and age-specific mating, agent-based modelling, Sweden, GGS.

WORK IN PROGRESS

Introduction (TO BE DEVELOPED)

We have seen an expansion of the new pattern of female educational advantage in Western Europe in recent decades. As educational policies have increasingly offered equal opportunities for women and men to attain higher levels of schooling, in parallel with increasing labour force aspirations of young people independently of their sex, the share of highly educated women has greatly increased over the decades and exceeded that of men across Europe from the 1990s onwards (Oláh 2015). Thus there are now more highly-educated women than men entering the mating market. This suggests a new gender imbalance, a reversal of the previous pattern of male dominance in higher education into a female educational advantage. The new pattern can generate tensions with respect to the traditional pattern of partnership formation characterized by female educational hypergamy, and hence leading to an education-specific mating squeeze.

In this study, we address the effect of changes in the gendered educational advantage on family building. We use agent-based modelling (ABM) to explore whether the gender- and educational structure of a society under certain education- and age-specific preferences for mating can lead to imbalances in first partnership formation across groups, and if so the extent of that impact. We focus on Sweden considered as forerunner of modern partnership patterns, and acknowledged for its commitment to equality in general and gender equality in particular.

Theory (TO BE DEVELOPED)

We take our departure in the theory of education-specific mating squeeze (Van Bavel, 2012). This theoretical framework builds on the observation that an expansion of female educational advantage has been seen in Western Europe in recent decades. Hence, high-educated women outnumber their male counterparts when entering the mating market. This is also the case for Sweden. This situation can generate a tension with respect to the traditional pattern of partnership formation, characterized by female educational hypergamy, i.e. women having a lower educational attainment than their partners, and hence leading to the education-specific mating squeeze.

It is possible that current preferences for the educational level of the partner, together with the attrition within groups of men/women with a certain educational level, could have population-level consequences in terms of increasing proportion of individuals who never find a partner. It is not known whether individuals will compromise their education- and age-specific preferences to find a partner, or whether preferences will change at the population level for age, education or both.

Van Bavel (2012) frames these questions in terms of so-called "escape routes". In our study we focus on the first three routes suggested by him, namely:

1. Educational homogamy –i.e. both partners have the same educational attainment – may become stronger and in turn, female hypergamy will be less prevalent.
2. Men will start partnering women who are more highly educated than themselves, a pattern change leading to female hypogamy ("down-dating"). This escape route demands a shift in preferences for educational attainment of the potential partner.
3. Age homogamy will decrease as young individuals choose to partner with older individuals to compensate for the lack of suitable candidates in their own age-group given traditional education preference. This escape route demands a shift of preferences for age, keeping preference for educational level constant.

However, the preference structure of a given population is not known, neither is known how the subsequent partnership decisions of individuals aggregate at the population level. Agent-based simulation is thus a promising way to test these scenarios and see how macro-level outcomes emerge from micro-level decisions under specified conditions. Specifically, we seek to explore the demographic outcomes of different preference scenarios, examining the "escape routes" suggested by van Bavel (2012).

Data

The ABM is calibrated with data from the Swedish Gender & Generation Survey (GGS)[1] (Thomson et al., 2015). The database consists of 9,688 respondents, 14% of which never had a co-resident partner. We exclude 998 observations corresponding to non-Swedish born respondents who moved to Sweden at age 8 or later. The reason for excluding them is that these individuals would not have been socialized in Sweden during their forming years, and since our research question addresses the impact of preferences, we aim for a homogeneous population with respect to preferences. We look at heterosexual partnership formation so we further exclude 66 observations corresponding to persons who had at least one same-sex partnership.

Finally, we exclude observations with missing values in the variables of relevance for our model. A total of 23 observations have missing values for the respondent´s educational level, 162 observations on first partnership start date and are therefore excluded, as along with 666 observations lacking information on the partner´s educational level. The youngest cohort in the analysis is not a 10-year cohort like the others, but includes 8 years, in order to keep only those respondents who had the time to achieve the highest educational level by the time of the survey, which excludes another 610 respondents. Thus, we have 7,163 respondents in our final working sample, 3,682 of which are female.

We classify the respondents and their partners according to the highest educational level achieved. We have three levels: 1.-primary-lower secondary (corresponding to ISCED levels 1-2), 2.-upper secondary (ISCED level 3), and 3.-post-secondary (ISCED levels 4-6).

We look at the start date of first cohabitation/marriage to determine the partnership type. The cases where the couple started cohabiting up to 6 months before marrying are considered as marriage, hereby assuming that the purpose of the original cohabitation was to get married.

In Fig. 1 we show the fraction of respondents in the groups by sex and educational level. The pattern varies by cohort. We see an overall decrease in marriage and an increase in cohabitation across cohorts, except for low-educated persons. Singles represent a small fraction but their share increases in the youngest cohort and for higher educational levels. High-educated women have a higher share in younger cohorts as expected, especially visible for cohabitation.

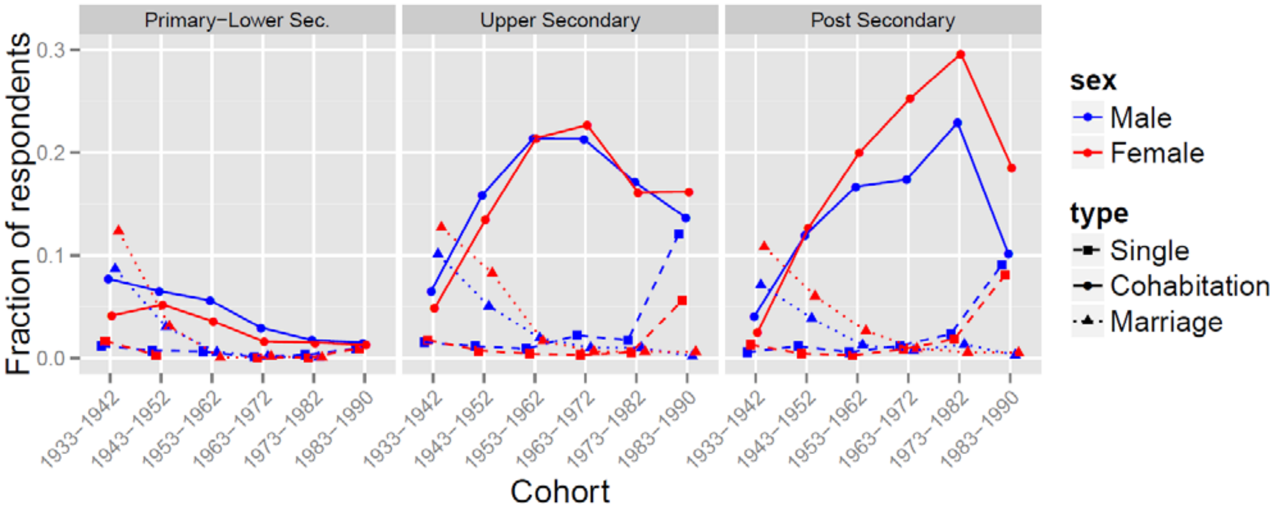

Figure 1. Fraction of respondents, by cohort, sex, educational level and partnership type.

[1] Project webpage: http://www.ggp-i.org/ .

We see the evolution of the partnership patterns in the next figure. Fig. 2a shows the fraction of women in the cohort with specific educational level, by partnership type (i.e. cohabitation and marriage) and couple type (i.e. hypergamic, homogamic and hypogamic). We can see an overall decrease in marriages across cohorts. Low-educated women tend to be most prevalent in hypergamic partnerships, and the fraction stabilized over time, while the fraction of high-educated women in hypogamic couples shows a tendency to increase[2]. The fraction of respondents in homogamic couples declines among low-educated women from older to younger cohorts. The homogamic pattern is most prevalent for women with upper-secondary education, except for the oldest cohort.

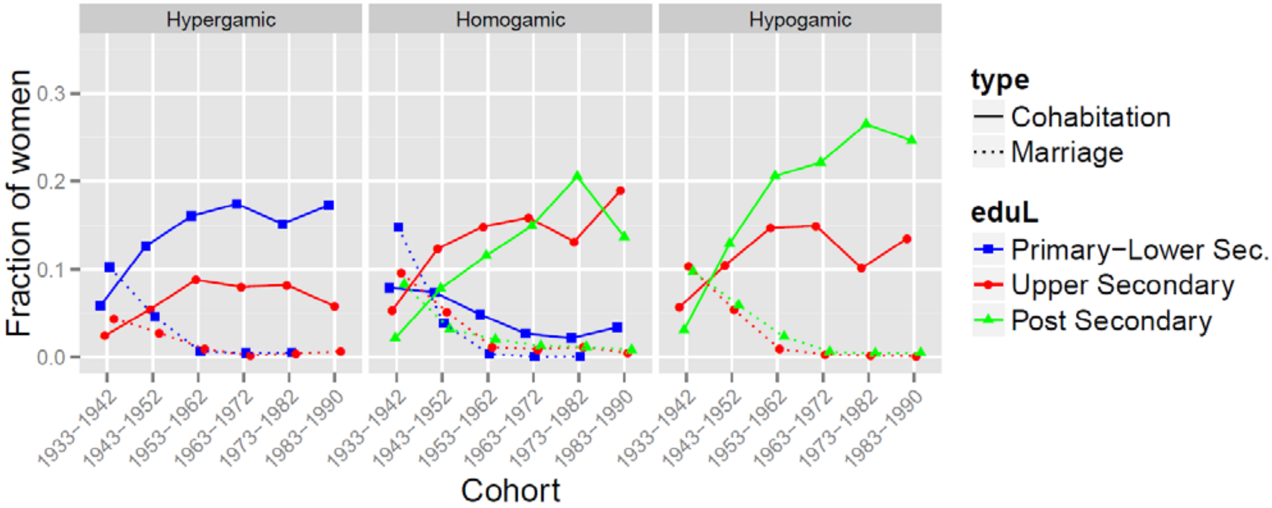

Figure 2a. Fraction of women in cohort, by couple type, educational level and partnership type.

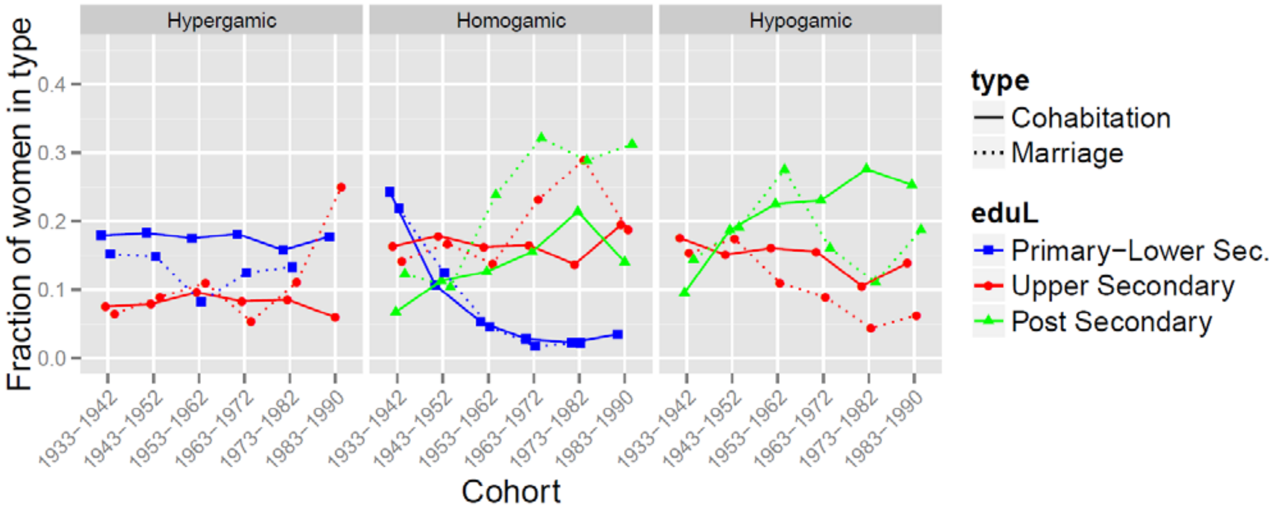

Figure 2b. Fraction of women in partnership type, by couple type, cohort and educational level.

While the fraction of women in a cohort gives information on the absolute number of women with a certain educational level in each couple- and partnership type (i.e. Fig. 2a), Fig. 2b shows the fraction of women in each partnership type, and thus allows comparing first cohabitation with first marriage. We see that the fractions for cohabitating and married couples are generally different, except for low-educated women in homogamic couples. Low-educated women in hypergamic couples are more likely to be in a cohabiting relationship than in a marriage. For women with upper-secondary education, cohabitation is generally quite stable across cohorts, and dominates over marriage in hyper- and homogamic couples in the oldest cohorts, and in nearly all cohorts for hypogamic couples. The fraction of married homogamic

[2] Hypo-, homo- and hypogamic are always defined from the woman's point of view.

couples increases, both for middle- and high-educated women, and exceed the fraction cohabiting for cohorts born around the mid-1950s and later. For hypogamic couples we see an increase in the fraction of married among older cohorts for these educational levels, but the fraction cohabiting exceed that of married for cohorts born in the mid-1950s and later among upper-secondary educated, and in mid-1960s and later for the most highly educated.

See Appendix A for more descriptive statistics for the GGS dataset. The dataset includes a weight variable for each observation. We tested computing weighted averages and it made very little difference so we decided to use unweighted data for our model calibration.

Method

Model description

In this paper, we rely on agent-based simulation as the tool of analysis (Billari and Prskawetz, 2003) to address individuals' preference-based partnership decisions and the outcomes of such decisions at the population level. In our model, agents have an endogenous desire to search for a partner. They are also endowed with preferences for the age and educational level of their potential mates: females prefer partners with educational level higher or equal they themselves have, while males prefer the opposite. The potential partner's age must fall within an age range that is gender specific. Furthermore, the weight of these preferences is adjusted with each additional year without a partner, giving successively less weight to the educational dimension. Agents take these factors into account when meeting a potential mate, and enter partnership accordingly or refrain from it.

The model is implemented and simulated in **python**, and the simulation results are analyzed in the **R** statistical environment[3]. We now proceed to describe the model in detail.

There is only one kind of entity, i.e. the individual agent representing an individual. Agents have the following main attributes: sex (male or female), educational level (primary-lower secondary, upper secondary and post-secondary), age x_i, partnership type (single, cohabitating or married) and preference weight α. Secondary attributes are: age at partnership formation, and score at partnership formation.

The model parameters are: preference for education β, preference for age γ and age range for mate search a_r. The preference parameters are a proxy for social norms regarding educational respectively age differences in partnership formation. The micro-dynamics in the model depend on the preference parameters, although the driver is endogenous, namely, the desire to find a partner that agents have. Space is not included in the model.

The main assumption is that single agents of both sexes have a constant goal to enter partnership and therefore actively seek partners of the opposite sex. Another assumption is that each agent has the chance to one partner search per month. Furthermore, the weighting function at the agent level is assumed to decay linearly with age as

$$\alpha_i(x_i) = \frac{x_{\max} - x_i}{x_{\max} - x_{\min}}, \quad (1)$$

where the age limits are set to x_{min} = 16 years, x_{max} = 50 years plus the number of years in the cohort. The model considers one alternative functional specification for $\alpha_i(x_i)$ in terms of a parabolic function. The assumption here is that no agent dies before x_{max}. Also, no migration is included; the population is modelled as a closed system.

The agent has a priory uncertainty about the potential mate's properties. Agents know, for each mate search, their own properties plus the sex, age and educational level of the potential partner. The

[3] R Core Team (2013). R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria. URL http://www.R-project.org/.

sensing process is exact, and gathering this information has no associated cost. There is no future prediction or communication mechanism, neither is learning through past action.

Each simulation consists of a population of 1,000 agents per cohort, and six cohorts. Each cohort simulation is treated separately, thus there is no inter-cohort partnership. The proportion of female agents in each cohort is proportional to the corresponding fraction in the GGS data. The attribute age is initialized from a random uniform distribution, since this is a good approximation to the data (see Appendix A). The initial α_i is determined from the initial age using Eq. (1). Initial educational level is set to primary-lower secondary, and immediately updated after initialization.

The educational levels of every single agent is updated every 12 steps. In the update, an agent is allowed to move on to the next educational level provided its age is larger than the limit (18 years for moving to level 2 and 22 years for moving to level 3) and that the number of agents in the upper level does not exceed the corresponding proportion in the empirical data.

A simulation step comprises a loop over a random fraction of all single agents (male and female), and represents one month. The fraction of agents that are allowed to meet is proportional to the fraction of GGS respondents living in sparsely populated areas, where this number is used as a proxy for the fact that not all agents in the population will interact simultaneously. The simulation time period is 12x34 steps.

Partner search is assumed to be started by any single agent. At each simulation step, i.e. 1 month, each single agent will randomly pick one single agent of the opposite sex out of the pool of single agents of the opposite sex that are within her age plus minus half the age range a_r. Knowing her α_i for that year and the education and age of the potential "husband" agent j, the searching agent computes a score h_{ij} according to

$$h_{ij}(\beta,\gamma,x_r) = (-1)^{sex_i} \cdot \alpha_i(x_i) \cdot \beta \cdot \frac{\Delta edu_{ij}}{2} + (1-\alpha_i(x_i)) \cdot \gamma \cdot \frac{|\Delta x_{ij}|}{x_r}. \quad (2)$$

The score is dependent on the differences $edu_{ij} = edu_i - edu_j$ and $x_{ij} = x_i - x_j$ (the age difference entering in absolute terms). The factor $(-1)^{sexi}$ incorporates assumption that females prefer partners with educational level higher or equal than themselves, while males prefer the opposite. The step continues when the potential mate of the opposite sex chosen by the agent computes his own score.

Partnership formation is dependent on the scores of the searching agent h_{ij} and the one of the potential partner h_{ji}. When both scores are positive, the agents enter the partnership; If one score is negative and the other non-negative then the agents get into the union with probability $\exp(10z_{ij})$, z_{ij} being the average score $z_{ij} = (h_{ij} + h_{ji})/2$. If both scores are negative the agents do not enter the partnership. For agents entering first partnership, the probability to marry is proportional to the corresponding fraction of respondents in the GGS data, and depends on the cohort and the educational levels of the agent and its partner (see Appendix A).

This step is repeated for all single agents in the random sample, until all agents are either partnered or have tried once and failed to partner. Then, time elapses one month, all agents age one month, recomputed their αs, and the process starts again. Agents exit the population after first partnership formation.

In our simulation analyses, we systematically vary the parameters between -1 and 1 in steps of 0.1, and set the age range to a_r = 7 years. We also simulated the case of age range 15 years, not shown as there were no qualitative changes in the outcomes for any escape routes. The age range is gender-dependent: females choose among single males within [-2, +5] years of her own age. Male agents choose among single female agents within [-5, +2] years.

Results

In order to facilitate the analysis, we divide the parameter combinations in four treatments, as follows: Tr1) $\beta \geq 0, \gamma \leq 0$, Tr2) $\beta \geq 0, \gamma > 0$, Tr3) $\beta < 0, \gamma > 0$, and Tr4) $\beta < 0, \gamma \leq 0$. Treatment 1 is our baseline for comparison, and corresponds to a situation where the education preference is non-negative and the preference for age is negative. This models the traditional pattern of partnership formation. All outcomes are averaged over 50 simulation runs.

Escape route #1: strengthening of educational homogamy

The first analysis corresponds to escape route #1. This is a scenario where the traditional pattern of female hypergamy is weakened in favour of homogamic partnerships. This would not be a result of a change in preferences, but rather of increasing number of high-educated women in the partnership market.

To explore this scenario, we simulate our model with the traditional preferences for education and age (Treatment 1), and look at the prevalence of couple types for different educational levels and partnership type. The simulations results are shown in Fig. 3a and Fig. 3b. First, we look at the number of female agents in each couple- and partnership type, as a fraction of a cohort (Fig. 3a). For marriage, we observe a decrease across cohorts following the empirical pattern seen in Fig. 2a, except in the case of homogamic marriages where all educational levels have very low prevalence. For cohabitation, we see an overall increase across cohorts for low-educated agents in hypergamic couples, as well as for high-educated agents in homo- and hypogamic couples, while we find a pattern of stabilizing after an initial increase in the older cohorts for middle-educated female agents in general. In both partnership types, the traditional hypergamic pattern is more dominant for low-educated females than for the upper-secondary educated, while women with post-secondary education have higher prevalence in homogamic couples than the middle-educated.

This simulated scenario indicates that a traditional partnership formation pattern applied to all cohorts and partnership types would result in high-educated cohabiting women being most prevalent in homogamic couples, and low-educated women representing a considerable fraction of hypergamic cohabiting couples. For upper-secondary education the most prevalent patterns are hyper- and hypogamy. Post-secondary educated female agents are most prevalent in hypogamic couples for cohorts born in the mid-1950s and later.

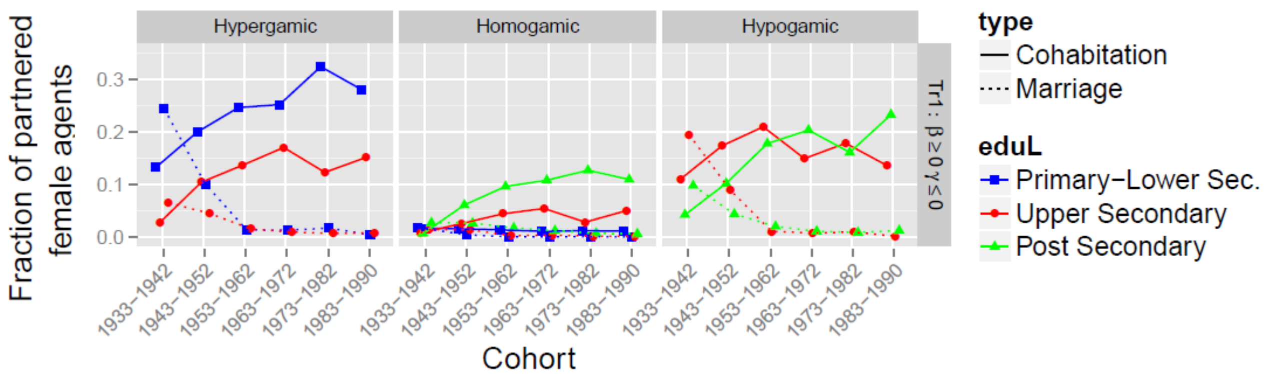

Figure 3a. Fraction of female agents in cohort, by couple type, educational level and partnership type. Treatment 1 (non-negative education preference, non-positive age preference). Values averaged by treatment and over 50 simulation runs.

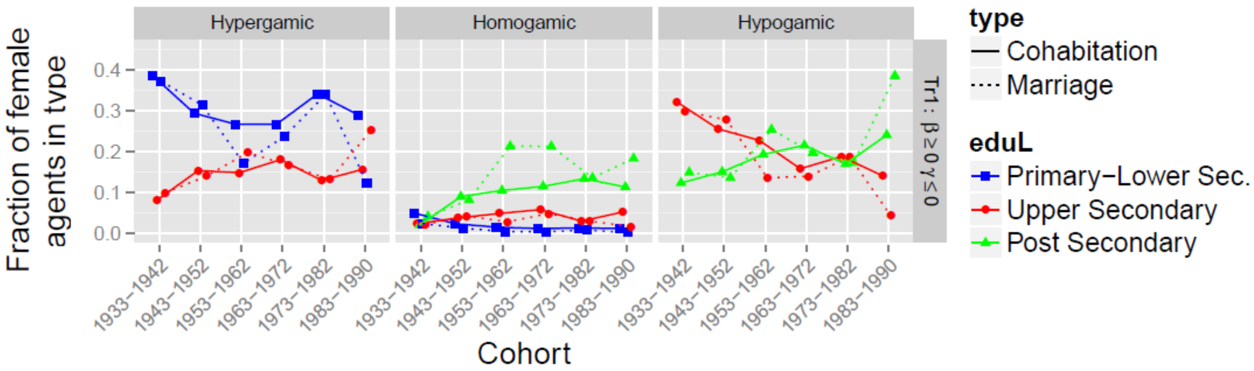

Figure 3b. Fraction of female agents in partnership type, by couple type, cohort and educational level. Treatment 1 (non-negative education preference, non-positive age preference). Values averaged by treatment and over 50 simulation runs.

The fraction of female agents in each partnership type is shown in Fig. 3b. Cohabitation and marriage patterns are quite similar for low- and middle-educated agents in homogamic couples, and middle-educated agents in hypergamic couples. Cohabitation tends to dominate for low-educated female agents in hypergamic couples and for middle-educated women in hypogamic couples. Marriage is more prevalent than cohabitation for homogamic high-educated couples and to the youngest cohorts also in hypogamic couples.

Escape route #2: shift in education preference ("partnering down")

The second analysis corresponds to escape route #2. This is a scenario where preferences for education shift, so that females would be more inclined to engage in hypogamous partnerships.

To explore this scenario, we compare our simulation results from Treatment 1 with the case where education preferences are reversed and age preferences still follow the traditional pattern (that is Treatment 4). The comparison is shown in Fig. 4a and Fig. 4b. Regarding the fraction of female agents in the cohorts, we can see that the overall patterns are quite similar (Fig. 4a). The only meaningful differences are that hypergamic unions are slightly more prevalent for low-educated female agents (Treatment 4) in the case of education preference reversal, especially for youngest cohorts. The fraction of homogamic cohabitations is lower as well for both the upper-secondary and the highly educated. Marriage patterns do not seem to be affected. So from the simulation's point of view we can say that this escape scenario does not produce significant changes in the hypergamy pattern.

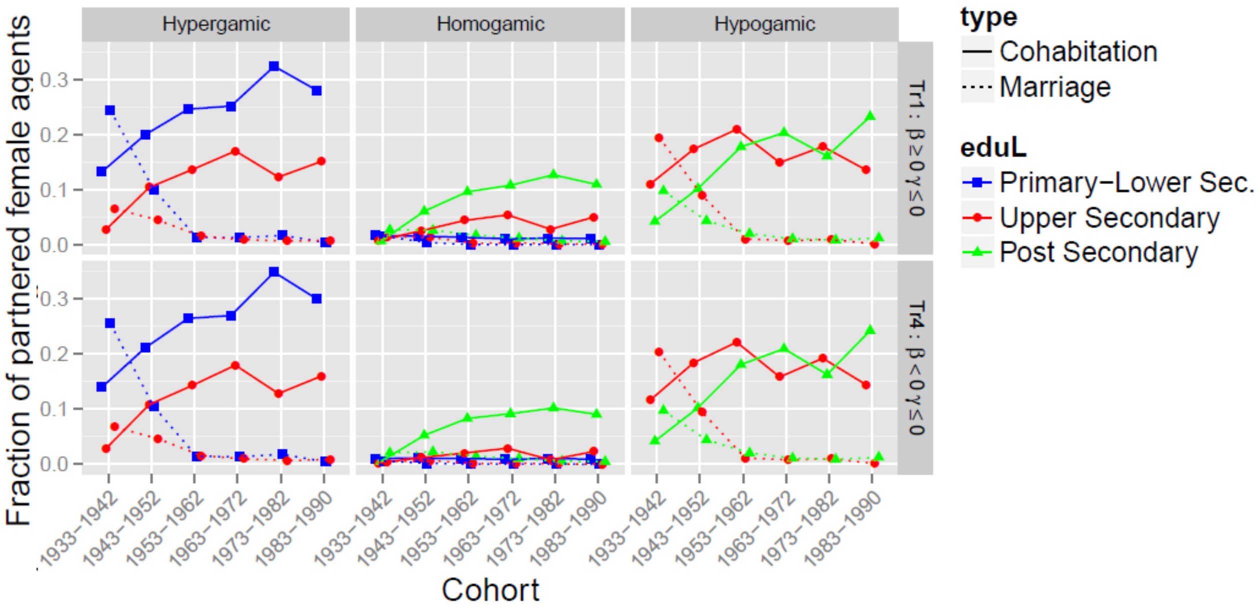

Figure 4a. Reverse in education preference. Fraction of female agents in cohort, by couple type, educational level and partnership type. Treatment 1 compared to Treatment 4. Values averaged by treatment and over 50 simulation runs.

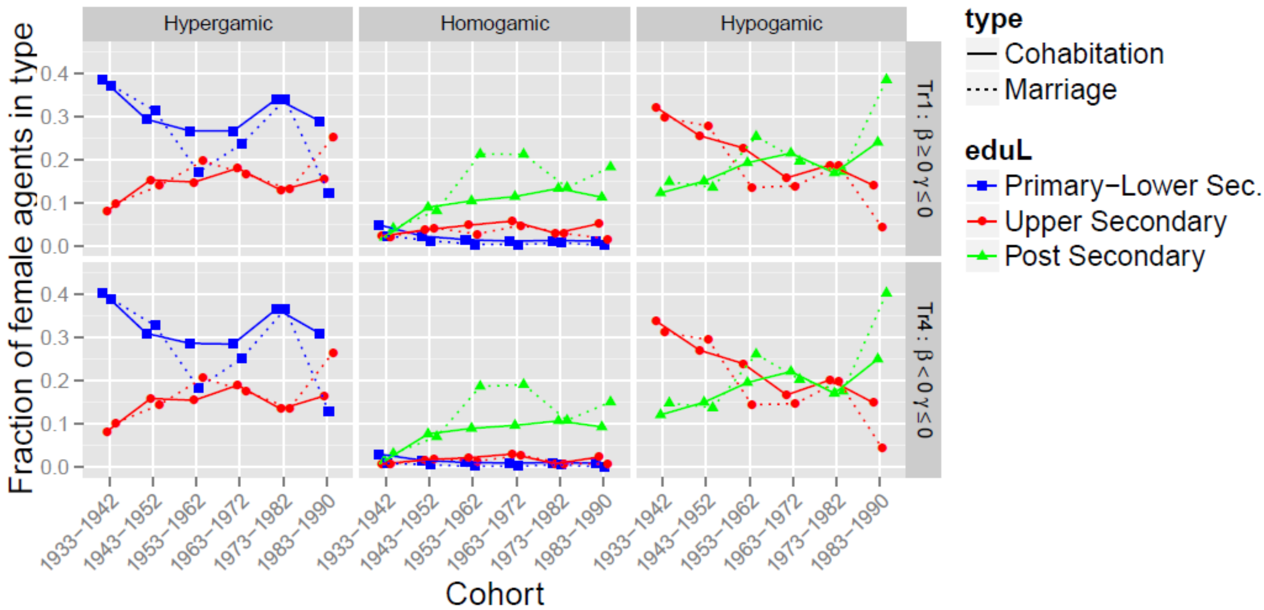

Figure 4b. Reverse in education preference. Fraction of female agents in partnership type, by couple type, cohort and educational level. Treatment 1 compared to Treatment 4. Values averaged by treatment and over 50 simulation runs.

As for the fraction of agents in each partnership type (Fig. 4b), the patterns in Treatment 4 are also quite similar to the baseline case in Treatment 1, except for a slight decrease in the fraction of middle-educated female agents in homogamic couples.

Escape route #3: shift in age preference

The third analysis focuses on escape route #3. This is a scenario where age preferences change. We explore this scenario by comparing the traditional pattern (Treatment 1) with a case where age preferences are reversed and education preferences are held as in the baseline case (Treatment 2).

The simulation results are shown in Fig. 5a and Fig. 5b. For the fraction of female agents in a cohort (Fig. 5a) we observe that a reversal in age preferences results overall in significantly less educational hypogamy and hypergamy, in favour of homogamy. Furthermore, the marriage pattern is qualitatively the same for all three types of couples, with not very low levels in the oldest cohort, but decreasing over cohorts and stabilizing at very low levels for those born in the mid-1950s and later. We finally notice that low-educated female agents in homogamic cohabitations show a stable pattern over cohorts, while the other two educational groups show an increase.

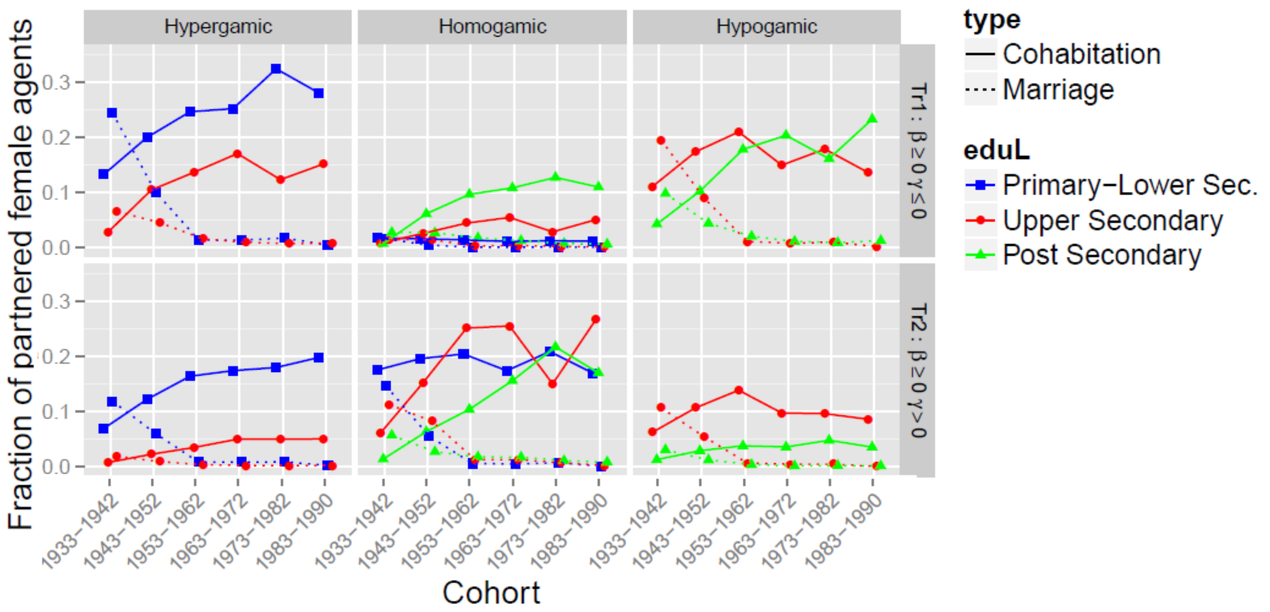

Figure 5a. Reverse in age preference. Fraction of female agents in cohort, by couple type, educational level and partnership type. Treatment 1 compared to Treatment 2. Values averaged by treatment and over 50 simulation runs.

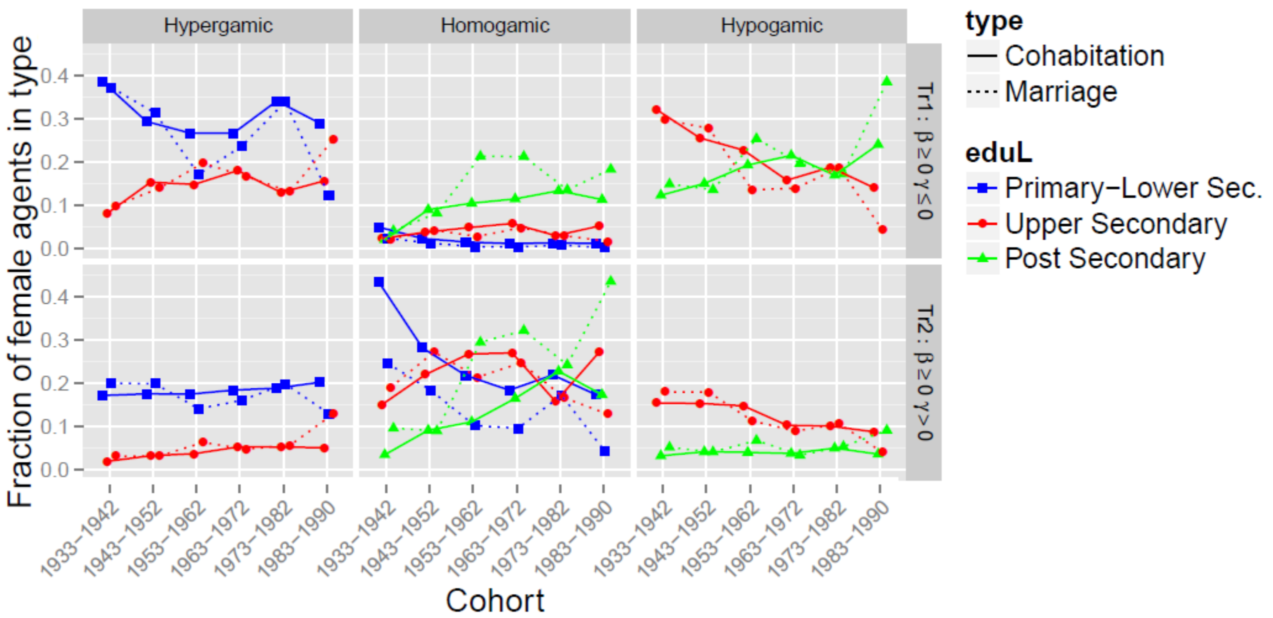

Figure 5b. Reverse in age preference. Fraction of female agents in partnership type, by couple type, cohort and educational level. Treatment 1 compared to Treatment 2. Values averaged by treatment and over 50 simulation runs.

Regarding the fraction of female agents in each partnership type (Fig. 5b), we see that first cohabitation and first marriage patterns become more similar and less prevalent, after the shift in age preferences, for female agents in hyper- and hypogamic couples, independently of educational level. In contrast, the patterns become increasingly different for homogamic couples, with cohabitation dominating over marriage for low-educated female agents across cohorts, and marriage dominating over cohabitation for high-educated female agents in all cohorts, and for the oldest cohorts of middle-educated women.

An additional scenario: shift in both education and age preferences

Theoretically, it is also possible that individuals may change both their education- and age preferences to adapt to the squeeze. This scenario is not proposed explicitly by Van Bavel (2012) but is worth exploring nonetheless.

We simulate this case by comparing Treatment 1 with a reversal in both education- and age preference (Treatment 3). This comparison is shown in Fig. 6a and Fig. 6b. We observe that the effect of simultaneous reversal of education and age preferences does not change the pattern observed for the shift on age preferences (Treatment 2 in Fig. 5a) as to the fraction of female agents in a cohort (Fig. 6a). Looking at the fraction of female agents in each partnership type, the same conclusion can be reached (Fig. 6b compared to Treatment 2 in Fig. 5b).

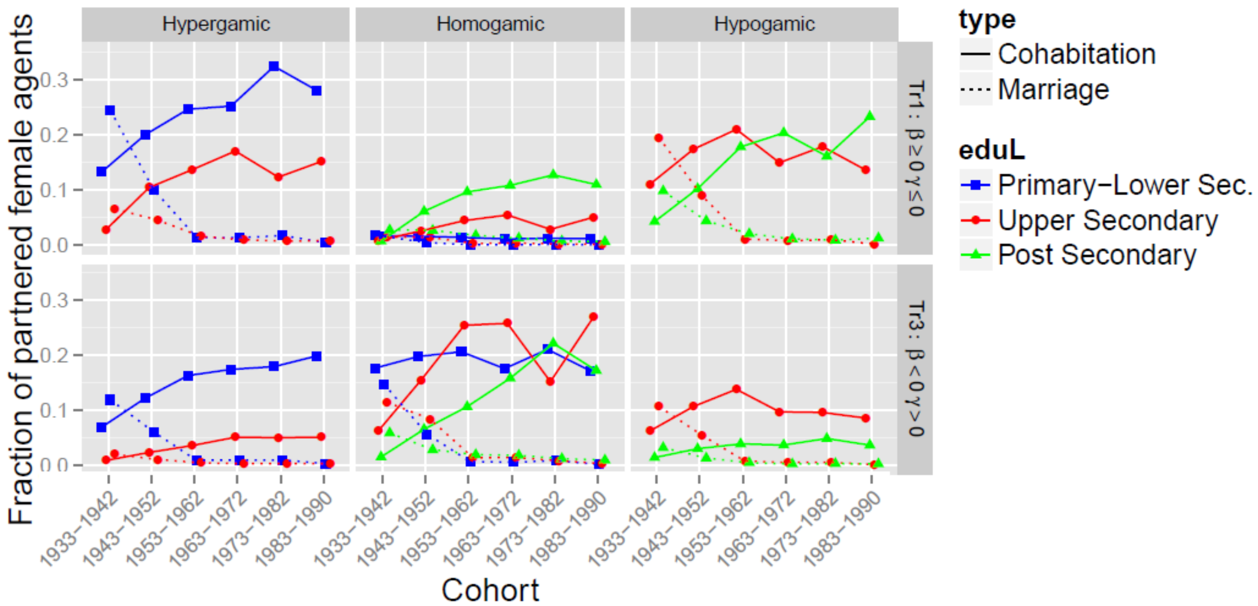

Figure 6a. Reverse in education and age preferences. Fraction of female agents in cohort, by couple type, educational level and partnership type. Treatment 1 compared to Treatment 3. Values averaged by treatment and over 50 simulation runs.

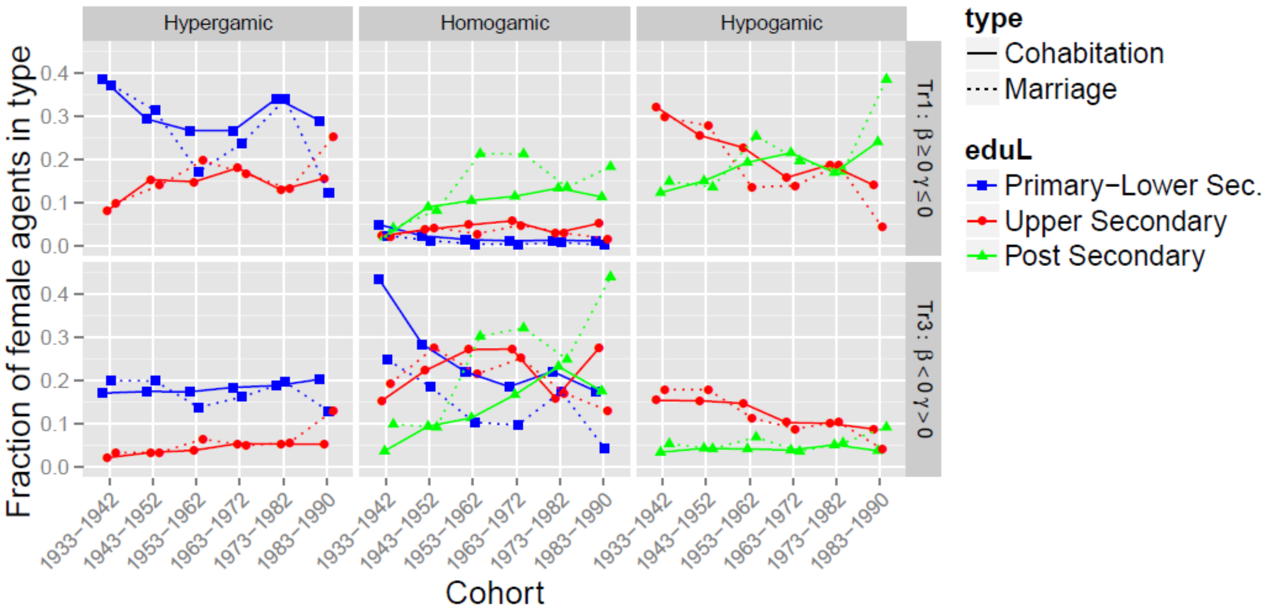

Figure 6b. Reverse in education and age preferences. Fraction of female agents in partnership type, by couple type, cohort and educational level. Treatment 1 compared to Treatment 3. Values averaged by treatment and over 50 simulation runs.

Discussion (to be developed)

Our agent-based model has allowed us to simulate different scenarios for education and age preferences across cohorts, corresponding to different "escape routes" suggested by Van Bavel (2012) plus an additional scenario.

Our results indicate that shifts in age preference have a larger impact on partnership patterns than shifts in education preference. Moreover, comparing our simulations with the GGS dataset, we can see that different educational level groups may follow different routes. For low-educated cohabiting women, shift in age preference (escape route #3) is the scenario that closest resembles in a qualitative way the patterns observed in the GGS dataset. In contrast, for middle- and highly-educated cohabiting women we see an increase in educational homogamy (escape route #1). For first marriage, the shift in age preference scenario (escape route #3) works well both for low- and middle-educated women, while highly-educated women seem to follow the path of strengthened educational homogamy (escape route #1).

Appendix A: empirical statistics for model calibration

Sex	Educational level	1933-1942	1943-1952	1953-1962	1963-1972	1973-1982	1983-1990
Male	Primary- lower secondary	177	104	68	33	22	25
Male	Upper secondary	182	221	243	246	199	260
Male	Post-secondary	118	170	186	194	267	195
Female	Primary- lower secondary	182	88	37	19	17	24
Female	Upper secondary	194	225	236	237	174	224
Female	Post-secondary	147	192	230	271	321	272
	Total	**1000**	**1000**	**1000**	**1000**	**1000**	**1000**

Table A1. Proportion of respondents in GGS data, by cohort, sex and educational level.

Cohort	1933-1942	1943-1952	1953-1962	1963-1972	1973-1982	1983-1990
Fraction of females	0.52	0.51	0.50	0.53	0.51	0.52
Fraction of respondents living in sparsely populated areas	0.10	0.10	0.09	0.07	0.05	0.06

Table A2. Fraction of female respondents and fraction of respondents living in sparsely populated areas in GGS data, by cohort.

Cohort	Respondent educational level	Partner educational level		
		Primary- lower secondary	Upper secondary	Post-secondary
1933-1942	Primary- lower secondary	0.65	0.65	0.7
1933-1942	Upper secondary	0.65	0.65	0.7
1933-1942	Post-secondary	0.7	0.7	0.8
1943-1952	Primary- lower secondary	0.35	0.35	0.3
1943-1952	Upper secondary	0.35	0.35	0.3
1943-1952	Post-secondary	0.3	0.3	0.3
1953-1962	Primary- lower secondary	0.05	0.05	0.1
1953-1962	Upper secondary	0.05	0.05	0.1
1953-1962	Post-secondary	0.1	0.1	0.15
1963-1972	Primary- lower secondary	0.05	0.05	0.05
1963-1972	Upper secondary	0.05	0.05	0.05
1963-1972	Post-secondary	0.05	0.05	0.1
1973-1982	Primary- lower secondary	0.05	0.05	0.05
1973-1982	Upper secondary	0.05	0.05	0.05
1973-1982	Post-secondary	0.05	0.05	0.05
1983-1990	Primary- lower secondary	0.01	0.01	0.05
1983-1990	Upper secondary	0.01	0.01	0.05
1983-1990	Post-secondary	0.05	0.05	0.05

Table A3. Fraction of married respondents in GGS data, by cohort and educational level of respondent and partner.

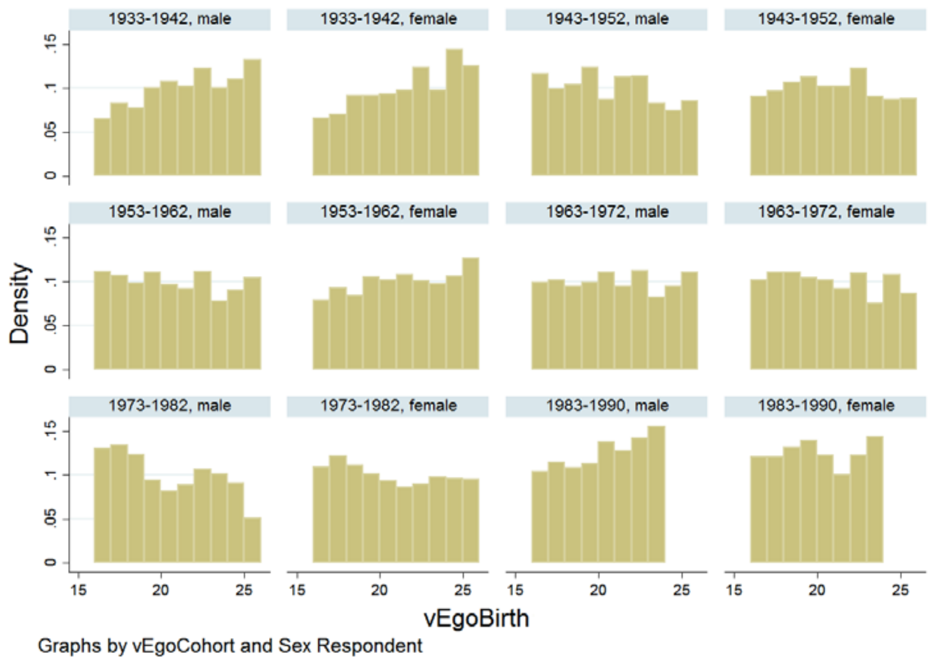

Table A4. Respondent age distribution when the youngest member in the cohort is 15 years old, by cohort and sex.

The mean age at first partnership by sex, educational level and partnership type is shown in Fig. A1. The age pattern for cohabitation is quite stable for all educational groups, with a slight decline for the younger cohorts. The age at first marriage for males rises and then decreases, mainly for cohorts born in the mid-1960s and later. Overall, the higher the educational level, the higher the average age at first partnership.

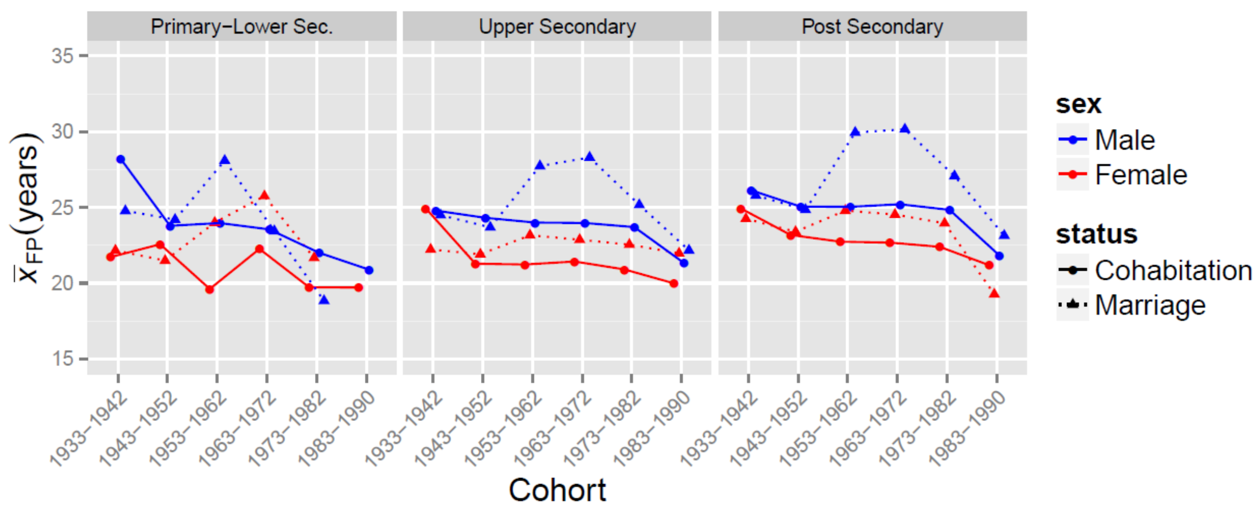

Figure A1. Mean respondent age at first partnership, by cohort, sex, educational level and partnership type.

Appendix B: full simulation results

[FULL SIMULATION OUTPUT HERE]

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